Graphical User Interface for Rehabilitation Software

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1 Introduction

Patients with multiple sclerosis use rehabilitation to slow down the manifestations of the disease. A team of researchers and students from Charles University and the University of West Bohemia is developing software (SW) that aims to move treatment into virtual reality (VR) as an alternative rehabilitation method. This software is being developed as part of the study *Virtual reality in the treatment of patients with multiple sclerosis*, as described in Rodina (2020) and Frank (2020). In the previous application version, therapeutic exercises were set up manually by writing to XML configuration files. Configuring, therefore, required therapists to have some technical knowledge and familiarity with the given data format.

This work aimed to create a convenient graphical user interface (GUI) that allowed simplifying the configuration of therapeutic exercises for the physiotherapy team. Therefore, therapists do not have to deal with unnecessary technicalities and can focus more on patients and the therapy itself. Ultimately, the implementation of the GUI can allow at least a portion of the treatment to be transferred to the home environment in the future, as stated by Frank (2022).

2 Development

A new GUI module was designed and implemented in the *Unity* development environment. The object-oriented language *C#* was used as the programming language for scripting in *Unity*. The target platform of the application was *Windows* operating system. The implementation was preceded by selecting a suitable user interface toolkit and analyzing the application's structure. This led to more efficient integration of new functionality into the already developed rehabilitation SW without the need to change the rest of the application. The GUI module for the exercise configuration was designed with an emphasis on backward compatibility with the original XML configuration.

As a toolkit for creating the user interface, I chose to use mostly the *Unity UI* because this package was also used during the previous development of the VR rehabilitation application. This toolkit contained sufficient tools from which I could model a graphical editor for configuring exercises. In addition to that, I also used the *IMGUI* package for a couple of advanced functionalities. Specifically, I used it for two interactive visual effects — the blinking effect and the floating help tooltip.

The implemented GUI is shown in Figure 1. On the left-hand side, there are *global settings* for adjusting the properties of the whole VR environment. In the middle, there is a list of *exercise definitions*, which can be added to the selected therapeutic plan. On the right-hand side, there is an ordered list of individual *exercises* with their parameters. This list represents the therapeutic plan, which is loaded from the XML configuration file.

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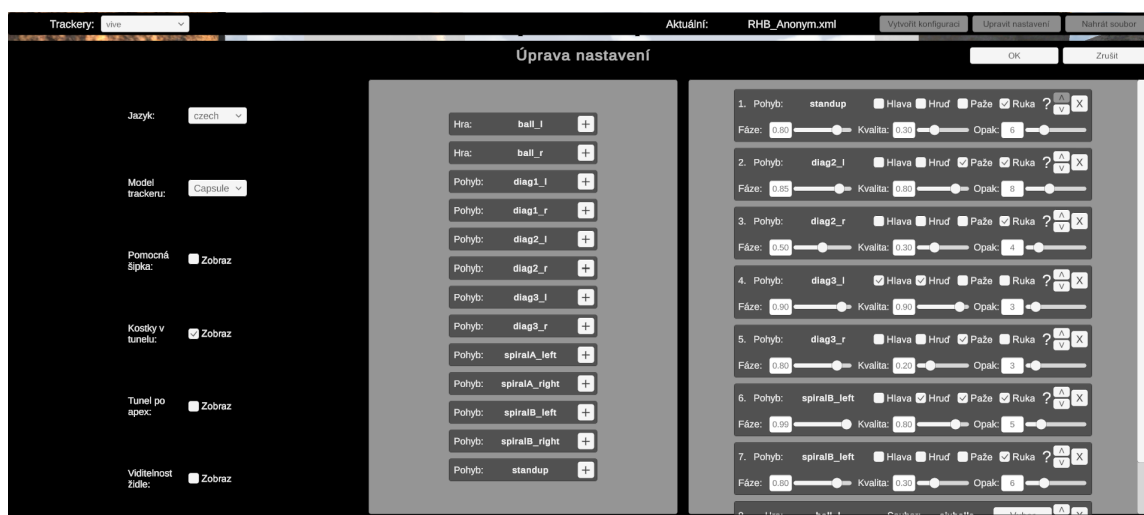
Figure 1: GUI for Configuring Exercises

3 Testing

The application was handed over to the therapeutic department of University Hospital Královské Vinohrady in Prague. A total of six physiotherapists tested the application and were quite satisfied with the new functionality. The final version of the GUI module implemented some of the features that emerged from the feedback, such as simplifying the creation of a new configuration file or introducing a *Cancel* button in the editing window.

4 Conclusion

The new version of the rehabilitation SW now allows the creation and editing of an individual therapeutic plan directly within the desktop application. The GUI module provides users with a comprehensible editing environment using visual representation. There is also a user manual describing individual parts of the GUI, as well as a video tutorial that demonstrates basic functionality.

Acknowledgement

References

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